

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
RE1		5.00	100.200	450	1.350
S1	0.049	5.00	100.000	600	1.350
S2	0.096	5.00	99.800	600	1.495
S3	0.017	5.00	99.800	900	1.626
S4-CC			99.800	1200	1.670
Ex. SW			99.600	1200	1.556

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	RE1	S1	11.600	0.600	98.850	98.650	0.200	58.0	150	5.15	50.0
1.001	S1	S2	27.000	0.600	98.650	98.380	0.270	100.0	150	5.59	50.0
1.002	S2	S3	21.900	0.600	98.305	98.174	0.131	167.0	225	5.96	50.0
1.003	S3	S4-CC	7.400	0.600	98.174	98.130	0.044	167.0	225	6.08	50.0
1.004	S4-CC	Ex. SW	8.600	0.600	98.130	98.044	0.086	100.0	225	6.19	49.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.323	23.4	0.0	1.200	1.200	0.000	0.0	0	0.000
1.001	1.005	17.8	6.6	1.200	1.270	0.049	0.0	64	0.933
1.002	1.009	40.1	19.7	1.270	1.401	0.145	0.0	111	1.004
1.003	1.009	40.1	22.0	1.401	1.445	0.162	0.0	119	1.032
1.004	1.307	52.0	21.8	1.445	1.331	0.162	0.0	102	1.251

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	11.600	58.0	150	Circular	100.200	98.850	1.200	100.000	98.650	1.200
1.001	27.000	100.0	150	Circular	100.000	98.650	1.200	99.800	98.380	1.270
1.002	21.900	167.0	225	Circular	99.800	98.305	1.270	99.800	98.174	1.401
1.003	7.400	167.0	225	Circular	99.800	98.174	1.401	99.800	98.130	1.445

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	RE1	450	Manhole	Adoptable	S1	600	Manhole	Adoptable
1.001	S1	600	Manhole	Adoptable	S2	600	Manhole	Adoptable
1.002	S2	600	Manhole	Adoptable	S3	900	Manhole	Adoptable
1.003	S3	900	Manhole	Adoptable	S4-CC	1200	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.004	8.600	100.0	225	Circular	99.800	98.130	1.445	99.600	98.044	1.331

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.004	S4-CC	1200	Manhole	Adoptable	Ex. SW	1200	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
RE1	100.200	1.350	450		0	1.000	98.850 150
S1	100.000	1.350	600		1	1.000	98.650 150
S2	99.800	1.495	600		0	1.001	98.650 150
					1	1.001	98.380 150
S3	99.800	1.626	900		0	1.002	98.305 225
					1	1.002	98.174 225
S4-CC	99.800	1.670	1200		0	1.003	98.174 225
					1	1.003	98.130 225
Ex. SW	99.600	1.556	1200		0	1.004	98.130 225
					1	1.004	98.044 225

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	0.0
Summer CV	0.750	30 year (l/s)	0.0
Winter CV	0.840	100 year (l/s)	0.0
Analysis Speed	Normal	Check Discharge Volume	x
Skip Steady State	x		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	45	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	2.40
Greenfield Method	IH124	Growth Factor 100 year	3.19
Positively Drained Area (ha)	0.160	Betterment (%)	0
SAAR (mm)	559	QBar	
Soil Index	3	Q 1 year (l/s)	
SPR	0.37	Q 30 year (l/s)	
Region	7	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Node S4-CC Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	98.130	Product Number	CTL-SHE-0075-2500-1000-2500
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.5	Min Node Diameter (mm)	1200

Node S2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	98.305
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	100.0	0.0	0.800	100.0	0.0	0.801	0.0	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991	1 year 720 minute summer	8.203	2.199
1 year 15 minute winter	76.857	30.991	1 year 720 minute winter	5.513	2.199
1 year 30 minute summer	71.439	20.215	1 year 960 minute summer	6.768	1.782
1 year 30 minute winter	50.133	20.215	1 year 960 minute winter	4.483	1.782
1 year 60 minute summer	48.435	12.800	1 year 1440 minute summer	4.949	1.326
1 year 60 minute winter	32.179	12.800	1 year 1440 minute winter	3.326	1.326
1 year 120 minute summer	30.053	7.942	30 year 15 minute summer	268.706	76.035
1 year 120 minute winter	19.966	7.942	30 year 15 minute winter	188.566	76.035
1 year 180 minute summer	23.233	5.979	30 year 30 minute summer	174.929	49.499
1 year 180 minute winter	15.102	5.979	30 year 30 minute winter	122.757	49.499
1 year 240 minute summer	18.475	4.882	30 year 60 minute summer	116.589	30.811
1 year 240 minute winter	12.274	4.882	30 year 60 minute winter	77.459	30.811
1 year 360 minute summer	14.169	3.646	30 year 120 minute summer	70.438	18.615
1 year 360 minute winter	9.210	3.646	30 year 120 minute winter	46.797	18.615
1 year 480 minute summer	11.185	2.956	30 year 180 minute summer	53.298	13.715
1 year 480 minute winter	7.431	2.956	30 year 180 minute winter	34.645	13.715
1 year 600 minute summer	9.182	2.511	30 year 240 minute summer	41.604	10.995
1 year 600 minute winter	6.274	2.511	30 year 240 minute winter	27.641	10.995

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year 360 minute summer	31.221	8.034	100 year +45% CC 120 minute summer	134.215	35.469
30 year 360 minute winter	20.295	8.034	100 year +45% CC 120 minute winter	89.169	35.469
30 year 480 minute summer	24.324	6.428	100 year +45% CC 180 minute summer	101.219	26.047
30 year 480 minute winter	16.160	6.428	100 year +45% CC 180 minute winter	65.795	26.047
30 year 600 minute summer	19.756	5.404	100 year +45% CC 240 minute summer	78.690	20.795
30 year 600 minute winter	13.498	5.404	100 year +45% CC 240 minute winter	52.280	20.795
30 year 720 minute summer	17.490	4.687	100 year +45% CC 360 minute summer	58.701	15.106
30 year 720 minute winter	11.754	4.687	100 year +45% CC 360 minute winter	38.157	15.106
30 year 960 minute summer	14.215	3.743	100 year +45% CC 480 minute summer	45.550	12.038
30 year 960 minute winter	9.416	3.743	100 year +45% CC 480 minute winter	30.262	12.038
30 year 1440 minute summer	10.161	2.723	100 year +45% CC 600 minute summer	36.875	10.086
30 year 1440 minute winter	6.829	2.723	100 year +45% CC 600 minute winter	25.195	10.086
100 year +45% CC 15 minute summer	505.670	143.087	100 year +45% CC 720 minute summer	32.556	8.725
100 year +45% CC 15 minute winter	354.856	143.087	100 year +45% CC 720 minute winter	21.879	8.725
100 year +45% CC 30 minute summer	332.000	93.944	100 year +45% CC 960 minute summer	26.340	6.936
100 year +45% CC 30 minute winter	232.982	93.944	100 year +45% CC 960 minute winter	17.448	6.936
100 year +45% CC 60 minute summer	222.268	58.739	100 year +45% CC 1440 minute summer	18.700	5.012
100 year +45% CC 60 minute winter	147.669	58.739	100 year +45% CC 1440 minute winter	12.567	5.012

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.71%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	1	98.850	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S1	10	98.715	0.065	6.9	0.0659	0.0000	OK
60 minute winter	S2	50	98.406	0.101	11.9	10.2429	0.0000	OK
60 minute winter	S3	44	98.413	0.239	6.3	0.2018	0.0000	SURCHARGED
60 minute winter	S4-CC	44	98.413	0.283	3.6	0.3206	0.0000	SURCHARGED
15 minute summer	Ex. SW	1	98.044	0.000	2.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S1	0.0	0.000	0.000	0.0414	
15 minute winter	S1	1.001	S2	6.7	0.926	0.376	0.1948	
60 minute winter	S2	1.002	S3	5.1	0.430	0.126	0.6240	
60 minute winter	S3	1.003	S4-CC	3.6	0.291	0.090	0.2943	
60 minute winter	S4-CC	Hydro-Brake®	Ex. SW	2.5				16.8

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.71%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	1	98.850	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S1	10	98.770	0.120	17.0	0.1213	0.0000	OK
120 minute winter	S2	118	98.640	0.335	15.7	34.0565	0.0000	SURCHARGED
120 minute winter	S3	116	98.640	0.466	4.6	0.3937	0.0000	SURCHARGED
120 minute winter	S4-CC	116	98.640	0.510	3.2	0.5764	0.0000	SURCHARGED
15 minute summer	Ex. SW	1	98.044	0.000	2.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S1	0.0	0.000	0.000	0.0841	
15 minute winter	S1	1.001	S2	16.4	1.120	0.926	0.3964	
120 minute winter	S2	1.002	S3	3.8	0.437	0.095	0.8710	
120 minute winter	S3	1.003	S4-CC	3.2	0.278	0.080	0.2943	
120 minute winter	S4-CC	Hydro-Brake®	Ex. SW	2.5				48.4

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.71%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE1	12	99.301	0.451	4.9	0.0717	0.0000	SURCHARGED
15 minute winter	S1	12	99.299	0.649	31.9	0.6545	0.0000	SURCHARGED
180 minute winter	S2	176	99.079	0.774	21.9	78.6545	0.0000	SURCHARGED
180 minute winter	S3	176	99.079	0.905	3.7	0.7647	0.0000	SURCHARGED
180 minute winter	S4-CC	176	99.079	0.949	2.8	1.0729	0.0000	SURCHARGED
15 minute summer	Ex. SW	1	98.044	0.000	2.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	RE1	1.000	S1	-4.9	-0.293	-0.209	0.2042	
15 minute winter	S1	1.001	S2	26.9	1.526	1.513	0.4753	
180 minute winter	S2	1.002	S3	3.2	0.416	0.080	0.8710	
180 minute winter	S3	1.003	S4-CC	2.8	0.315	0.070	0.2943	
180 minute winter	S4-CC	Hydro-Brake®	Ex. SW	2.5				54.9